



The Application of PBL, PJBL, and Inquiry Learning Models on Student Learning Outcomes

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Abstract: This study aims to examine the effectiveness of Problem-Based Learning (PBL), Project-Based Learning (PJBL), and Inquiry Learning (IL) models on students' cognitive learning outcomes in the Islamic Religious Education and Character subject. The research employed a quantitative approach with a quasi-experimental design and involved three Grade IX classes at Junior High School Madani Boarding School Celak, selected using purposive sampling. A cognitive learning test was used as the research instrument. Since the data were not normally distributed, the analysis was conducted using the non-parametric Kruskal-Wallis test. The results showed no significant difference in students' cognitive learning outcomes among the PBL, PJBL, and IL groups, with a significance value of 0.920 ($p > 0.05$). Thus, the three learning models demonstrated relatively equal effectiveness in improving students' cognitive achievement. This study recommends optimizing the implementation of each model through innovative strategies and learning media to further enhance learning outcomes.

Keyword: cognitive learning outcomes; PBL; PJBL; and Inquiry Learning.

Abstrak: Penelitian ini bertujuan untuk mengetahui efektivitas model pembelajaran Problem Based Learning (PBL), Project Based Learning (PJBL), dan Inquiry Learning (IL) terhadap hasil belajar kognitif siswa pada mata pelajaran Pendidikan Agama Islam dan Budi Pekerti. Penelitian menggunakan pendekatan kuantitatif dengan desain eksperimen semu dan melibatkan tiga kelas IX di SMP Madani Boarding School Celak sebagai sampel, yang dipilih melalui teknik purposive sampling. Instrumen yang digunakan berupa tes hasil belajar kognitif. Karena data tidak berdistribusi normal, analisis dilakukan menggunakan uji non-parametrik Kruskal-Wallis. Hasil penelitian menunjukkan bahwa tidak terdapat perbedaan yang signifikan antara hasil belajar siswa yang menggunakan model PBL, PJBL, dan IL, dengan nilai signifikansi sebesar 0,920 ($p > 0,05$). Dengan demikian, ketiga model pembelajaran tersebut memiliki efektivitas yang relatif setara dalam meningkatkan hasil belajar kognitif siswa. Penelitian ini merekomendasikan perlunya optimalisasi penerapan model melalui inovasi strategi dan media pembelajaran agar hasil belajar dapat ditingkatkan secara lebih maksimal.

Kata kunci : hasil belajar kognitif; PBL; PJBL; dan Inquiry Learning.

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Introduction

The cognitive learning achievements of ninth-grade students at SMP Madani Boarding School Celak in the teaching process of Islamic Studies and Character Education subjects still show unsatisfactory results. Based on the results of the odd-semester evaluation for the 2024/2025 academic year, the average student score reached only 79. Meanwhile, the minimum passing grade (KKM) set is 80. This gap indicates that most students have not fully understood the material. This highlights the need for efforts to enhance the quality of education, focusing on the development of students' cognitive competencies

Previous studies have indicated that applying innovative learning approaches can improve students' learning outcomes (Ayyubi et al., 2024). The Problem-Based Learning (PBL) model is effective in enhancing critical thinking skills and learning outcomes (Hidayati et al., 2024) (Bariyah et al., 2022); (Fauzi et al., 2023)). Project-Based Learning (PJBL) encourages students to be more active in connecting religious concepts with real life (Rofiqoh et al., 2025) (Zuhdiyyah & Nurhidayati, 2023); (Fitriyani & Ajizah, 2024); (Hasanah et al., 2024). Inquiry Learning can improve students' conceptual mastery and analytical skills in religious topics (Wuni et al., 2023); (Husni et al., 2025); (Syaifullah & Maulidiyah, 2024); (Santoso et al., 2023).

However, most previous studies have only tested one learning model in a single context, so there has been no systematic comparison of the effectiveness of the three models in similar contexts. This study aims to address this gap by comparing the effectiveness of PBL, PJBL, and Inquiry Learning models, each implemented in different classes: IX A, IX B, and IX C at SMP Madani Boarding School Celak.

Thus, there is an important research gap to be addressed, namely the extent to which the effectiveness of PBL, PJBL, and Inquiry Learning models can be compared as an effort to optimize students' cognitive understanding in Islamic Religious Education and Ethics subjects (Amirulloh et al., 2025). There have been few studies that directly test these three models simultaneously in the same classroom and learning context, particularly in the unique environment of a boarding school.

The selection of SMP Madani Boarding School Celak as the research location was based on the distinctive characteristics of boarding schools, which offer more intensive control over the learning environment, structured religious routines, and emotional closeness between students and educators. Such an environment is considered more conducive to the implementation of active and exploratory learning, as required in the three learning models. This justification is reinforced by the learning ecology theory, which states that the learning environment context has a significant influence on the effectiveness of learning strategies.

The main focus of this study is to analyze the success rate of the Problem-Based Learning, Project-Based Learning, and Inquiry Learning models on the cognitive abilities achieved by ninth-grade students in Islamic Religious Education and

Character Education at SMP Madani Boarding School Celak. Using a quantitative approach and one-way ANOVA analysis technique, the findings of this study are expected to contribute theoretically and practically to the selection of the most appropriate and contextual learning strategies for Islamic Education teachers in boarding schools and public schools.

Methods

This study uses a quantitative approach with a quasi-experimental design of the Nonequivalent Control Group Design type. This design was chosen because the researcher did not perform full randomization of the subjects, yet it still allows for comparing the effects of different learning models under equivalent classroom conditions.

The population in this study consists of all ninth-grade students at SMP Madani Boarding School Celak for the 2024/2025 academic year. The research sample consists of three classes selected using purposive sampling, considering the similarity of the average scores on the previous semester's exams as an indicator of relatively equivalent initial academic ability (Suriani & Jailani, 2023); (Asrulla et al., 2023); (Ramadani et al., 2025); (Subhaktiyasa, 2024). The three classes were class IX A, which used the Problem-Based Learning (PBL) model; class IX B, which used the Project-Based Learning (PJBL) model; and class IX C, which used the Inquiry Learning model. The Inquiry Learning model in this study served as the control class, as it was the learning method commonly used by PAI teachers at the school.

The assignment of learning models to classes was conducted semi-randomly, considering the researchers' readiness and schedule efficiency, while ensuring that all classes received equal treatment. The learning materials used were adapted to the Grade IX Islamic Education curriculum. Each learning model was implemented over three sessions of equal duration. The homogeneous boarding school learning environment helped control external variables such as learning time, learning atmosphere, and student discipline.

Before the main analysis, the test results were analyzed to ensure the fulfillment of the normality assumption through the Kolmogorov-Smirnov test and the homogeneity of variance through the Levene test. After the assumptions were fulfilled, the data were analyzed using One-Way ANOVA to determine the differences in cognitive learning outcomes between groups. If significant differences were found, the Post Hoc LSD (Least Significant Difference) test was conducted to identify which groups had significant differences (Nainggolan et al., 2025); (Okoye & Hosseini, 2024).

The results of this analysis are expected to provide an empirical picture of the effectiveness of each learning model in improving students' cognitive achievement in Islamic Religious Education and Character Education subjects, as well as serving

as a practical reference for teachers in determining appropriate and contextual learning strategies, particularly in boarding school environments.

Result and Discussion

Result

The following are the results obtained from this study:

Table 1 Validity Test
Case Processing Summary

| | | Cases | | |
|-------------------|------|-----------|-----------|-----------|
| | | Valid | Missing | Total |
| | | N Percent | N Percent | N Percent |
| Learning_Outcomes | PBL | 28 100.0% | 0 0.0% | 28 100.0% |
| | PJBL | 26 100.0% | 0 0.0% | 26 100.0% |
| | IL | 27 100.0% | 0 0.0% | 27 100.0% |

Based on the Case Processing Summary table, all student learning data in each learning model group (PBL, PJBL, and Inquiry Learning) is valid with no missing data. The number of students involved in this study consisted of 28 students in the PBL group, 26 students in the PJBL group, and 27 students in the Inquiry Learning group. With a validity percentage of 100% for each group, this indicates that the data used in the analysis is fully complete and reliable for further statistical tests, such as one-way ANOVA, without the need for data imputation or adjustment.

Table 2 Descriptive Statistical Test
Descriptives

| Learning_Model | | | Statistic | Std. Error |
|-------------------|------|----------------------------------|-----------|------------|
| Learning_Outcomes | PBL | Mean | 83.9286 | 2.61959 |
| | | 95% Confidence Interval for Mean | 78.5536 | |
| | | Lower Bound | | |
| | | Upper Bound | 89.3035 | |
| | | 5% Trimmed Mean | 84.8095 | |
| | | Median | 88.0000 | |
| | | Variance | 192.143 | |
| | | Std. Deviation | 13.86156 | |
| | PJBL | Mean | 82.0000 | 3.08645 |
| | | 95% Confidence Interval for Mean | 75.6433 | |
| | | Lower Bound | | |
| | | Upper Bound | 88.3567 | |
| | | 5% Trimmed Mean | 82.9231 | |
| | | Median | 88.0000 | |
| | | Variance | 247.680 | |
| | | Std. Deviation | 15.73785 | |
| IL | | Mean | 84.6667 | 2.31679 |
| | | | | |

| | | |
|----------------------------------|-------------|----------|
| 95% Confidence Interval for Mean | Lower Bound | 79.9044 |
| | Upper Bound | 89.4289 |
| 5% Trimmed Mean | | 85.4568 |
| Median | | 88.0000 |
| Variance | | 144.923 |
| Std. Deviation | | 12.03840 |

Based on the results of descriptive analysis, it is known that the highest average (mean) learning outcomes were found in the Inquiry Learning (IL) group at 84.67, followed by the PBL group at 83.93, and the PJBL group at 82.00. However, the median score for all three groups was the same, at 88.00, indicating that most students in each group achieved consistently high scores. Looking at the data distribution, the highest standard deviation was found in the PJBL group (15.74), indicating greater variation in scores among students, while the IL group had the lowest standard deviation (12.04), indicating a more homogeneous distribution of scores. These findings suggest that the Inquiry Learning model not only produces the highest average scores but is also more stable than other models.

Table 3 Data Normality Test
Tests of Normality

| Learning_Model | | Kolmogorov-Smirnov ^a | | | Shapiro-Wilk | | |
|-------------------|------|---------------------------------|----|------|--------------|----|------|
| | | Statistic | df | Sig. | Statistic | df | Sig. |
| Learning_Outcomes | PBL | .195 | 28 | .008 | .857 | 28 | .001 |
| | PJBL | .187 | 26 | .020 | .913 | 26 | .031 |
| | IL | .151 | 27 | .115 | .928 | 27 | .061 |

a. Lilliefors Significance Correction

Based on the Output Test of Normality from the three Learning Models (PBL, PJBL, and IL), the Sig values from Kolmogorov-Smirnov and Shapiro-Wilk of two of the three learning models are smaller (<) than 0.05, so the data from the student learning evaluation results in the subjects of Islamic Religious Education and Ethics are not normally distributed (Ahadi & Zain, 2023).

Table 4 Homogeneity Test
Test of Homogeneity of Variance

| | | Levene | | | |
|-------------------|--------------------------------------|-----------|-----|--------|------|
| | | Statistic | df1 | df2 | Sig. |
| Learning_Outcomes | Based on Mean | 1.143 | 2 | 78 | .324 |
| | Based on Median | .660 | 2 | 78 | .520 |
| | Based on Median and with adjusted df | .660 | 2 | 72.803 | .520 |
| | Based on trimmed mean | 1.087 | 2 | 78 | .342 |
| | | | | | |

Based on the results of the Levene Test for variance homogeneity, the significance value (Sig.) obtained was 0.324 for calculations based on the mean, 0.520 based on the median, and 0.342 based on the trimmed mean. Since all significance values are greater than 0.05, it can be concluded that the data has homogeneous variance.

Since the data on Islamic Education learning outcomes are not normally distributed, the next step is a non-parametric test, namely the Kruskal-Wallis test (Dewi et al., 2023); (Annisak et al., 2024).

Table 5 Mean Rank Values
Ranks

| | Learning_Model | N | Mean Rank |
|-------------------|----------------|----|-----------|
| Learning_Outcomes | PBL | 28 | 41.75 |
| | PJBL | 26 | 39.46 |
| | IL | 27 | 41.70 |
| | Total | 81 | |

Mean Rank shows the average ranking of each model group. In the above case:

1. The average ranking of the PBL model is higher than the average ranking of the PJBL model
2. The average ranking of the Inquiry Learning model is higher than the average ranking of the PJBL model

The next step is to observe the following output to determine whether there are differences in the averages between the three models:

Table 6 Kruskal-Wallis test
Test Statistics^{a,b}

| | Learning_Outcomes |
|--------------------------------------|-------------------|
| Kruskal-Wallis H | .168 |
| df | 2 |
| Asymp. Sig. | .920 |
| a. Kruskal-Wallis Test | |
| b. Grouping Variable: Learning_Model | |

Since the significance value obtained is 0.920, which exceeds the threshold of 0.05, the null hypothesis (H_0) is not rejected. This indicates that there is no significant difference in student learning outcomes in Islamic Religious Education and Ethics subjects when applying the Problem-Based Learning, Project-Based Learning, or Inquiry Learning approaches.

Discussions

A normality test was conducted on the learning outcome data for Islamic Religious Education and Moral Education based on three learning models: Problem-Based Learning (PBL), Project-Based Learning (PJBL), and Inquiry Learning (IL). The test was performed using the Kolmogorov-Smirnov and Shapiro-Wilk methods. The results showed that two out of three groups had significance values below 0.05, indicating that the data were not normally distributed. Therefore, intergroup comparisons were conducted using the nonparametric Kruskal-Wallis test (Matondang & Nasution, 2022). The Kruskal-Wallis test results showed a significance value of 0.920, greater than 0.05, so the null hypothesis (H_0) was accepted, and there were no significant differences in students' cognitive learning outcomes between the groups using the three learning models.

Although no statistically significant differences were found, the Mean Rank values indicate that the PBL model has the highest ranking, followed by Inquiry Learning and PJBL. However, this trend should not be overinterpreted as a definite advantage without statistical evidence to support it. On the other hand, the previous discussion tends to show confirmation bias by highlighting the positive trends in PBL and IL results, without acknowledging that these differences could arise randomly.

The lack of significant differences necessitates critical reflection on the methodological aspects of the research. The sample size per group, which is close to the minimum threshold (<30), likely resulted in low statistical power, making it difficult to detect even small differences. Additionally, the relatively short treatment duration may limit the optimal impact of the learning model on students' cognitive achievements. These aspects should be explicitly discussed to provide context for the obtained results and avoid overly optimistic interpretations.

These findings have also not been sufficiently integrated with previous research results showing the effectiveness of each model separately. For example, various studies indicate that PBL and PJBL are effective in enhancing conceptual understanding and critical thinking skills in specific contexts, but may not necessarily demonstrate superiority when directly compared in a single study with different variables and control conditions. Therefore, these findings should be framed within the understanding that the effectiveness of learning models is contextual, influenced by intervention duration, implementation quality, teacher and student characteristics, and learning environment support.

Going forward, further research with stronger experimental designs, larger sample sizes, and longer intervention durations is needed to more convincingly assess the relative effectiveness of PBL, PJBL, and Inquiry Learning models. Additionally, a thorough evaluation of the implementation process of learning

models in the classroom is important to determine whether the lack of effectiveness stems from the model design or its implementation.

Conclusion

This study aimed to analyze the effectiveness of Problem-Based Learning (PBL), Project-Based Learning (PJBL), and Inquiry Learning models on ninth-grade students' cognitive abilities in Islamic Religious Education and Character Education at SMP Madani Boarding School Celak. The Kruskal-Wallis test results revealed no statistically significant differences between the three learning models (significance value $0.920 > 0.05$). However, descriptive analysis indicated that the Inquiry Learning model produced the highest mean score (84.67), followed by PBL (83.93) and PJBL (82.00). The Inquiry Learning model also demonstrated the most homogeneous score distribution with the lowest standard deviation (12.04), suggesting greater stability compared to other models.

These findings contribute theoretically by demonstrating that in the context of Islamic Religious Education in boarding school environments, all three active learning models show relatively equivalent effectiveness. This supports learning ecology theory, which emphasizes the significant influence of the learning environment on strategy effectiveness. The structured boarding school environment, with intensive control and emotional closeness between students and educators, appears to provide conducive conditions for implementing various active learning models. Practically, these results offer flexibility for Islamic Education teachers in selecting appropriate learning models based on student characteristics and classroom conditions, with Inquiry Learning potentially being the preferred choice when consistency of learning outcomes is prioritized.

The study acknowledges several limitations, including relatively small sample sizes approaching minimum thresholds (<30 per group), short treatment duration (three sessions), and the use of a quasi-experimental design without full randomization. Future research should employ larger samples, longer intervention periods, true experimental designs with full randomization, and process evaluation to identify factors influencing model effectiveness. Despite the absence of significant differences, this study provides valuable empirical evidence for Islamic Religious Education in boarding schools and establishes a methodological foundation for future research in this domain.

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